pressure drop produces a loss of energy, since the steam expands through the valve without doing any useful work. Referring again to fig; 2, the isothermal expansion or throttling through the governing valve is represented by the line A_0A. So that in this case the steam is supplied to the throttle valve at a pressure of 215 Ib. absolute (i.e. 200 Ib. on the pressure gauge), but before reaching the nozzles of the first stage its pressure has been throttled to 200 Ib. absolute.

As a basis of comparison of all turbines it is usual to take the heat drop based on the pressure in front of the throttle valve, and consequently the heat drop would be given by the line A_0C_0.

CHAPTER III

Calculation of Blade and Nozzle Dimensions

Expansion of Steam in a Nozzle.—When steam is allowed freely to expand in a nozzle, the available energy or expansion energy released performs work upon the mass of the steam itself and produces kinetic energy in the form of a high steam velocity.

Let P-t be the initial pressure at inlet to nozzle in pounds per square inch;

P_2, the final pressure at discharge from nozzle in pounds per square inch;

A, the heat available in adiabatic expansion between the pressures P_x and P_2 in B.Th.U.;

W, the weight of steam passed per second;

C_0, the theoretical velocity attained at discharge from the nozzle, assuming no frictional loss (in feet per second).

Then the energy available is WJA (ft.-lb.),

And the kinetic energy generated is $W\frac{C^2}{2g}$ (ft.-lb).

Equating these values, we have

$$WJA = W\hat{}\,;$$
S

whence $C_0^2 = 2gJh,$

$C_0 = 22_3\text{-}8v/A,$..........................(i)

This expression gives the full theoretical velocity due to the heat drop A,

assuming that there is no loss due to frictional resistance, and that in front of the nozzle the steam is initially at rest.

In actual practice the velocity obtained is always less than the theoretical.

Thus, if CJL is the actual velocity,

Ci = 223-8<K/A............................(2)

where *<j>* is the velocity coefficient of nozzle.